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UNIVERSITY OF ALBERTA

JUDGES' EVALUATIONS OF THE POST-TREATMENT SPEECH OF STUTTERERS AND THE SPEECH OF NORMAL SPEAKERS

BY

CONNIE LAM

A THESIS SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE
IN
SPEECH-LANGUAGE PATHOLOGY

DEPARTMENT OF SPEECH PATHOLOGY AND AUDIOLOGY

Edmonton, Alberta
FALL 1995

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DEGREE: MASTER OF SCIENCE

YEAR THIS DEGREE GRANTED: 1995

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled JUDGES' EVALUATIONS OF THE POST-TREATMENT SPEECH OF STUTTERERS AND THE SPEECH OF NORMAL SPEAKERS submitted by CONNIE LAM in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in SPEECH-LANGUAGE PATHOLOGY.

Phyllis Schneider

Phyllis Schneider

Deborah Kully

Deborah Kully

Peter Calder

Peter Calder

Date: September 22, 1995

DEDICATION

To the loving memory of my uncle Patrick, whose strength and courage inspired me to complete this project.

ABSTRACT

The purpose of this study was to investigate naive judges' speech naturalness and likeability ratings of stutterers' post-treatment uncontrolled and controlled speech and normal speech.

The uncontrolled and controlled speech of 3 stutterers and the speech of 3 normal speakers were recorded. The stutterers had undergone a prolonged speech treatment program. Using two nine-point scales, 30 judges rated each sample in terms of how natural the speech sounded and how much they liked listening to it. In response to open-ended questions about speech naturalness and likeability, the judges identified speech characteristics which influenced their ratings.

Results indicated that judges rated controlled speech as significantly more natural-sounding and more liked than uncontrolled speech. Judges cited speech rate, prosody, stuttering, and flow of speech as common characteristics which influenced their ratings. Intra- and inter-rater reliability was high. Clinical implications of the findings were discussed.

ACKNOWLEDGEMENTS

I wish to express my deep appreciation to those who made the completion of this project possible:

- to Dr. Einer Boberg, thesis advisor, who taught me that my academic endeavors were "cognitively nourishing". I am indebted to Dr. Boberg for his continuous guidance and support throughout this project.

- to Deborah Kully and Dr. Schneider for their helpful suggestions and encouragement at times when they were most needed.

- to Dr. Calder for his helpful advice and for offering his time to be on the committee.

- to Dr. Warren for her helpful suggestions with the data analysis.

- to Cynthia, Bev, Angelika, and Cindy for the countless hours put together which they devoted to help with this project.

- to the speakers and subjects who willingly gave up their time to participate in this study and who made the completion of the project possible.

- to my family for their undying support and encouragement throughout the course of my graduate studies.

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CHAPTER I

INTRODUCTION

Many stuttering treatment programs are based on the techniques of prolonged speech, fluency skills, and its variants (Bloodstein, 1987). The use of these techniques aids in producing speech which is slower, controlled and stutter-free. As the client establishes the techniques for controlled speech and progresses through the treatment program, it is common that fluency is quickly achieved in the clinical setting. The clinical environment thus becomes a cue for fluency and the client becomes fluent without having to use speech controls. This quickly achieved fluency has been commonly referred to as "lucky fluency" or "spontaneous fluency" (Boberg & Kully, 1985; Conture, 1990; Perkins, 1979, 1981, 1983, 1992; Starkweather, 1993). The client may rely on this uncontrolled spontaneously fluent speech after treatment has ceased. As the client continues to rely on lucky fluency and continues to abandon speech controls, stuttering may eventually reappear in the uncontrolled speech. Continued reliance on uncontrolled speech may eventually lead to relapse (Boberg, 1981; Boberg, Howie, & Woods, 1979; Boberg & Kully, 1985; Perkins, 1979, 1981, 1983, 1992; Starkweather, 1993).

One common observation of prolonged speech treatment programs is that the resultant speech of stutterers sounds unnatural to listeners when compared to the speech of nonstutterers (e.g. Onslow & Ingham, 1987). Furthermore, it

has been proposed that some stutterers who have undergone prolonged speech treatment may choose not to use controlled speech due to its perceived unnaturalness or abnormality (Boberg et al., 1979; Craig & Calver, 1991; Onslow & Ingham, 1987; Perkins, 1979, 1981, 1983, 1992). The clients may perceive that controlled speech sounds unnatural to listeners and may decide to use and rely on uncontrolled speech or lucky fluency, thus risking the occurrence of relapse.

There is a need to investigate the naturalness of controlled and uncontrolled speech of treated stutterers as perceived by naive listeners. Moreover, there is likewise a need to investigate listeners' preference for controlled or uncontrolled speech. Such a study may provide additional information regarding perceived speech naturalness and its role in relapse. The results of the study may also have clinical implications in terms of counselling clients to use controlled speech and in changing clients' attitudes and perceptions which may hinder the use of controlled speech after treatment (Mallard & Meyer, 1979).

The purpose of this study was twofold:
The first purpose was to evaluate how naive judges perceive the speech naturalness of post-treatment controlled and uncontrolled speech (which contains stutters) of treated stutterers. The second purpose was to evaluate judges' likeability or preference for controlled and uncontrolled speech.

CHAPTER II

REVIEW OF THE LITERATURE

A review of the literature will focus on the following areas: uncontrolled speech and relapse, speech naturalness, and listener preference for stuttered and treated speech of stutterers.

Uncontrolled speech and relapse

Lucky fluency

The issue of lucky fluency after stuttering treatment and the problem of relapse has been discussed by various researchers (Boberg, 1981). Despite the paucity of systematic research in the area of spontaneous fluency, the notion of lucky fluency or uncontrolled speech of treated stutterers as a factor in relapse has been raised by some researchers (Boberg et al., 1979; Boberg & Kully, 1985; Perkins, 1979, 1981, 1983, 1992; Starkweather, 1993). Perkins (1983) stated that "...fluency is easily obtained within hours, if not minutes" (p. 158). For example, fluency may be achieved if some parameters of speech, such as intensity or rate, are changed. A period of spontaneous fluency commonly occurs as the stutterer establishes his speech controls during treatment and as the clinical environment acts as a cue for fluent speech. Boberg and Kully (1985) referred to spontaneous fluency as:

> ...fluency that emerges with little or no effort on

> the part of the client. It probably results from the cumulative effects of proceeding through the structured program wherein the fluent and dysfluent speech is appropriately consequated, clinicians become conditioned stimuli for fluent speech, and self-confidence flourishes. The problem is that such fluency is tenuous and breaks down easily under stress (p.61).

The period of lucky fluency may last for a few days, weeks, months, or even years. However, it is usually temporary (Perkins, 1979).

Microstutters

Uncontrolled speech may be fluent or it may contain residual stuttering. This residual stuttering has been referred to as "microstutters" (Boberg et al., 1979). Microstutters are minor stutters which are fast and fleeting, and may include minimal tension and struggle behavior from the client. Microstutters may be barely observable and the client may not be aware of them. Because the client may not recognize the stutters, they may go unconsequated. "Cancellation" or "self-correction" is one technique which is commonly used to consequate a stutter. With this technique, when the client stutters on a word, he or she is required to repeat the dysfluent word using controlled speech. Cancellation thus acts as a consequating event for reducing the stuttering behavior (Boberg & Kully, 1985). It is likely for microstutters to appear if the client continues to speak

without the use of controls.

Furthermore, after the completion of treatment, it is likely that the client will return to an environment which contains cues associated with stuttering. Thus, microstutters may be influenced by environmental cues. Boberg et al. (1979) suggested that microstutters are similar to an avoidance response which is reinforced and difficult to extinguish. "Microstutters are reinforced because they help to avoid a further breakdown. The speaker finishes his phrase and is further reinforced. Moreover, the reinforcement is likely provided on an intermittent schedule and thus make the microstutterings still more resistant to extinction" (p. 110).

These residual stutters are usually smaller in magnitude and frequency than the stutters which occurred in the client's pre-treatment speech. However, the magnitude and frequency of the residual stutters varies from client to client. The stutters in the client's pre-treatment speech are usually longer, more tense, and more frequent than are the residual stutters. Pre-treatment stutters may also be accompanied by secondary behaviors. Some examples of secondary behaviors include head jerking, head nodding, facial tension, and body movements. These secondary behaviors are usually decreased during treatment and are barely noticeable immediately after treatment. However, as the client continues to use and rely on uncontrolled speech; as maintenance practice and the use of controls continue to be abandoned; and as microstutters

continue to be unconsequated, these residual stutters may "...increase both in magnitude and frequency, and become overt stutters" (Boberg et al., 1979, p. 110). The presence of unconsequated residual stuttering and the continued use of uncontrolled speech may eventually lead the client to relapse. Eventually, the client may revert back to his or her pre-treatment stuttering behaviors, severity, and frequency.

Maintenance practice

Boberg et al. (1979) raised the issue that maintenance practice and the use of controlled speech may be punishing to the stutterer. Practising controlled speech may be punishing because the stutterer must use an artificial and controlled speech pattern rather than speak spontaneously.

Speech practice may also be difficult to maintain because the consequences for missed practice are delayed and intermittent (Boberg et al., 1979). Missed practice may not be punished immediately. Relapse may not occur immediately due to a short period of missed practice. Therefore, the stutterer may continue to gamble on lucky fluency or uncontrolled speech. Furthermore, an individual is unlikely to continue a behavior which is viewed as punishing.

Moreover, the client may choose not to practice and instead, use uncontrolled speech because fluency may be inconsistent with the individual's self-concept as a stutterer (Conture, 1990; Perkins, 1979).

Constant speech monitoring

Another notion associated with the issue of uncontrolled speech and relapse is that normal speakers do not have to constantly monitor and control their speech. The stutterer may tire of having to continuously monitor his or her speech and use controls in order to maintain fluency. Rather than have the burden of constantly using speech controls, the stutterer relies on lucky fluency. Perkins (1979, 1981, 1983) stated that it is more difficult for severe stutterers to continuously use speech controls than it is for mild stutterers and that lucky fluency is more available to mild stutterers. Thus, relapse is more likely to occur for severe stutterers. However, relapse may eventually occur for those who do not use speech controls regardless of their stuttering severity.

Unnaturalness of final speech pattern

In addition to the burden of constant speech monitoring, another reason for the stutterers' use of uncontrolled speech may be the unnatural sounding pattern of the controlled speech.

Perkins (1979, 1992) referred to the speech of stutterers who use the method of delayed auditory feedback (DAF) as a "drone". The method of DAF resulted in speech which was fluent but also unnatural sounding. As the stutterer speaks at faster rates, it is common for the use of speech controls to be abandoned. Perkins reported that the stutterers

preferred to abandon their speech controls and use uncontrolled speech rather than speak in an unnatural sounding manner. They also preferred stuttering over the unnatural sounding drone.

Franken, Boves, Peters, and Webster (1992) reported that the perceptual quality of the post-treatment speech of stutterers did not improve as compared to their pre-treatment speech. This was measured with 2 bipolar scales: unpleasant-pleasant and unnatural-natural. On a related note, Kalinowski, Noble, Armson, and Stuart (1994) required listeners to rate the speech naturalness of the pre-treatment and post-treatment speech of 5 mild and 5 severe stutterers. Results suggested that the post-treatment speech of both groups of stutterers were rated as more unnatural than their pre-treatment speech. The researchers speculated that unnatural-sounding speech may be a common outcome of stuttering treatment and that stutterers may be reluctant to use techniques learned in treatment due to this outcome.

The results of a study by Craig and Calver (1991) indicated that some stutterers who had completed a smooth speech program felt embarrassed about using their speech skills. Craig and Calver indicated that the unnaturalness of controlled speech could result in negative self-perceptions which could hinder the use of the speech skills. They stated that "if the speech product is unacceptable, the stutterer will most likely cease using the skill and experience relapse"

(p. 284). Other researchers have supported this notion by stating that stutterers who undergo speech treatments that produce speech which does not sound normal may be reluctant to maintain their skills, may prefer stuttering over the unnatural speech pattern, and may be more likely to relapse (Onslow & Ingham, 1987; Perkins, 1983; Runyan & Adams, 1979).

It should be noted that there are different techniques for the teaching of prolonged and controlled speech. Some techniques produce speech which sounds more unnatural than the speech resulting from other prolonged speech methods. In some prolonged speech treatments, all syllables are stressed equally, thus, resulting in an unnatural sounding controlled speech pattern. Other treatments, however, emphasize that stressed syllables are prolonged more than unstressed syllables (eg. Boberg & Kully, 1985; Perkins, 1984). Therefore, the intonation patterns of speech are maintained and the resultant speech sounds less unnatural. Highly unnatural sounding speech, therefore, is not a universal criticism of all prolonged speech treatments.

Concerns regarding perceptual differences in the speech of treated stutterers as compared to normal speakers have given rise to studies investigating speech naturalness.

Speech naturalness

Judging speech naturalness

One criterion used to evaluate success of a stuttering treatment program is that "the subject's speech must sound

natural and spontaneous to listeners" (Bloodstein, 1987, p. 404). Perkins (1981) stated that "[the] starting point for determining normalcy is in the ear of the listener" (p. 176). Many investigators have raised the concern that the post-treatment speech of stutterers sounds perceptually different as compared to the speech of normal speakers. Although percentage syllables stuttered (%SS) and speech rate (SPM = syllables per minute) have been commonly used to evaluate treatment outcome, these measures do not necessarily reflect speech naturalness directly. There appears to be a lack of reliable and valid measures to evaluate the speech quality of treated stutterers (Martin, Haroldson, & Triden, 1984; Onslow & Ingham, 1987).

Speech naturalness is a subjective notion and there seems to be a lack of agreement on "...how different speech has to sound before it is no longer considered natural" (Martin, 1981, p. 23). There also seems to be a lack of consistency regarding which variables affect the perception of speech naturalness or normalcy (Ingham & Packman, 1978; Martin, 1981). Despite these difficulties, many researchers have attempted to study the speech quality of stutterers who undergo treatment.

The first investigation of speech naturalness of stutterers was attempted by Jones and Azrin (1969). Listeners judged the speech naturalness of stutterers whose speech was affected by various durations of a vibrotactile rhythmic

signal. The results suggested that listeners regarded rhythmic speech which contained some stuttering to sound more natural than rhythmic speech which contained no stuttering. The researchers suggested that rhythmic speech containing no stuttering sounded more unnatural due to the "pronounced speech regularity" and the overall decreased rate.

Perkins, Rudas, Johnson, Michael, and Curlee (1974) examined the effectiveness of two treatment methods for stuttering. Treatment method 1 involved rate control using delayed auditory feedback; treatment method 2 involved rate control as well as breathstream, phrasing, and prosody management. Listeners were required to judge normalcy of speech resulting from the two treatment methods. A 4-point scale ranging from "normal" to "abnormal" was used to judge fluency, prosody, and rate of speech. Findings indicated that treatment method 2 produced more normal sounding speech than method 1.

Ingham and Packman (1978) required listeners to rate the speech of stutterers who were treated with a prolonged speech treatment. The listeners were required to rate the stutterers' speech in terms of prosody, fluency, rate, and naturalness using the aforementioned 4-point scale developed by Perkins et al. (1974). Listeners were also asked to indicate whether a speech sample was from a stutterer or a normal speaker. Findings indicated that there were no significant differences between the prolonged speech of

treated stutterers and the speech of nonstutterers in terms of prosody, fluency, rate and naturalness when judged by listeners. However, listeners were able to differentiate between the speech samples of stutterers and nonstutterers. Thus, it seems that the speech of stutterers contained characteristics which made it perceptually distinguishable from the speech of nonstutterers.

Runyan and Adams (1978, 1979) completed perceptual studies of the speech of "successfully treated stutterers" who had undergone a number of treatment programs. These included Van Riperian treatment, metronome-conditioned speech retraining, delayed auditory feedback, operant conditioning, precision fluency shaping, and holistic treatment. Groups of sophisticated and unsophisticated listeners were required to judge whether the speech sample was from a stutterer or a nonstutterer. Results indicated that both groups of listeners were able to distinguish between the fluent speech of stutterers and nonstutterers.

Harold and Murdoch (1986) investigated whether untrained listeners could differentiate between the speech of treated stutterers and the speech of normal speakers. They also attempted to identify characteristics which aided listeners in distinguishing between the two types of speech. Listeners used the 4-point scale developed by Perkins et al. (1974) to judge prosody, rate, and fluency. Results revealed that the group of listeners were able to reliably identify the fluent

speech of treated stutterers when their speech was paired with the speech of a normal speaker who was matched for gender and age. Findings also showed that the stutterers' speech were judged to be significantly different in terms of prosody and rate.

In an attempt to quantify speech naturalness of stutterers, Martin, Haroldson, and Triden (1984) developed a 9-point speech naturalness rating scale (1 = highly natural sounding speech and 9 = highly unnatural sounding speech). The development of the scale led the way for further speech naturalness research. Martin et al. suggested the importance of a valid and reliable measure which could be used to evaluate the speech naturalness of individuals. Martin et al. stated that "...if speech naturalness is to be used meaningfully in studies dealing with various clinical and experimental treatments for stuttering, it must be determined empirically whether speech naturalness is a useful and scalable phenomenon" (p. 53). Thirty unsophisticated listeners were required to rate one-minute recordings of speech samples of 10 nonstutterers, 10 stutterers employing 250-ms delayed auditory feedback (DAF), and 10 stutterers not using DAF. A definition of speech naturalness was not provided for the listeners. The results suggested that the mean naturalness ratings for both groups of stutterers were significantly higher (more unnatural) than the mean naturalness rating for the nonstutterer speech samples. There

were no significant differences in the speech naturalness ratings between the two stutterer groups. Importantly, as a group, the judges were able to rate speech naturalness reliably though the authors noted that the reliability of individual judges was somewhat lower. Intraclass correlations for inter-rater reliability were R = .98 for the stutterer samples, R = .98 for the stutterer DAF samples, and R = .75 for the nonstutterer samples. Intra-rater reliability was assessed by having the listeners re-rate the speech samples one to three weeks after the initial rating session. Eighty-eight percent of the listeners' second ratings were within +/- 1 scale value of their original ratings. Based on the results of their study, Martin et al. concluded that listeners were able to consistently scale speech naturalness. However, additional research is necessary to determine whether a single listener is able to judge speech naturalness reliably.

Ingham, Gow, and Costello (1985) attempted to obtain additional data regarding the usefulness of the 9-point speech naturalness rating scale developed by Martin et al. (1984). Naive listeners rated one-minute audiotaped speech samples of stutterers who were in the instatement and transfer phases of a prolonged speech treatment program. Results showed that listeners were able to differentiate between the speech of stutterers and nonstutterers when nonparametric statistics were used to analyze the data. However, this finding did not occur when parametric statistics were employed. Ingham et al.

questioned whether nonparametric statistics should be used to analyze data in speech naturalness studies. Ingham et al. also found that listeners judged the speech of stutterers to sound unnatural (as compared to the speech of nonstutterers) but that their speech was normally fluent. The authors concluded that their findings lend support to the data from the Martin et al. (1984) study which suggested that the 9-point rating scale may be a valid and reliable measure for evaluating the speech quality of individuals.

Onslow, Adams, and Ingham (1992) extended the study by Martin et al. (1984). They evaluated the reliability of repeated speech naturalness ratings on the same subject. Secondly, they evaluated the reliability of ratings made by sophisticated and naive listeners. Lastly, they evaluated whether the duration of the speech interval effected reliability of ratings. Thirty sophisticated and thirty naive judges rated audiotaped speech samples of stutterers at either 15, 30, or 60 second intervals. The stutterers were in a prolonged speech treatment program. Results from Onslow et al. suggested lower intra- and interjudge reliability when compared to results obtained from Martin et al. There appears to be a lack of consistency in the findings of the two studies. Onslow et al. suggested that differences may exist due to the nature of the listeners' task; differences in the speech samples in the two studies; and the presence of more unreliable judges in the second study. Furthermore, Onslow et

al. did not find any significant differences in the mean naturalness ratings of the sophisticated and naive judges. Mean naturalness rating was 5.36 for the naive judges and 5.06 for the experienced judges. Lastly, the findings indicated that the 60 second interval resulted in higher inter- and intrajudge reliability than the 15 second interval. Furthermore, both of these speech intervals resulted in higher reliability than the 30 second interval. However, the authors stated that "...whereas these differences may be statistically significant, they are not substantial" (p. 1000).

Runyan, Bell, and Prosek (1990) investigated whether a difference existed between speech naturalness ratings of treated stutterers and nonstutterers. They also investigated if listeners were able to identify the speech of treated stutterers from the nonstutterers and if naturalness ratings were associated with pre-treatment stuttering severity. The stimulus audiotapes used in the Runyan and Adams studies (1978, 1979) were also used in this study. Ten sophisticated listeners used the 9-point scale developed by Martin et al. (1984) to rate the speech naturalness of the speakers. Results revealed a significant difference between the mean naturalness ratings of the stutterers and nonstutterers. The stutterers were rated as more unnatural sounding. Furthermore, Runyan et al. (1990) found that there were two subgroups of treated stutterers. One group were stutterers who were "easy-to-identify" and the other group were stutterers

who were "difficult-to-identify". The speech samples identified as those produced by stutterers were rated as sounding more unnatural than the samples of stutterers who were more difficult to identify. Furthermore, the ratings of difficult-to-identify stutterers were not significantly different from the nonstutterers' speech samples ratings. Lastly, there was no significant difference among the naturalness ratings of stutterers based on pre-treatment severity. The findings of this study should be interpreted with caution because the speech samples were from six different treatment programs; severity was evaluated with "mild", "moderate", and "severe" only; and naturalness ratings were based on speech samples of phrase and sentence length (Onslow, Hayes, Hutchins, & Newman, 1992).

Onslow et al. (1992) used the rating scale developed by Martin et al. (1984) to examine the effect of speech mode (conversation\monologue), occasion of speech sampling, and subjects (treated stutterers\nonstutterers) on speech naturalness scores. Fourteen stutterers in a prolonged speech treatment program served as subjects. Speech samples were obtained on three occasions. They were obtained following two phases of the program (establishment and transfer) and also after two weeks of discharge from the program. Findings indicated that speech naturalness scores were higher (ie. more unnatural) for the treated stutterers than for the nonstutterers and that the naturalness ratings remained stable

throughout the program and two weeks after. There were no significant differences in the naturalness ratings assigned to the conversation or monologue speech samples for both groups of speakers. Onslow et al. (1992) also evaluated the relationship between pre-treatment stuttering measures and post-establishment speech naturalness ratings. Stuttering measures included %SS and SPM. Results indicated that naturalness ratings were higher (ie. more unnatural) for speakers whose pre-treatment stutterings were the most severe as compared to speakers whose stutterings were less severe.

Franken, Boves, Peters, and Webster (1992) attempted a perceptual evaluation of the speech of nonstutterers and the speech of stutterers who were treated in a Dutch adaptation of the Precision Fluency Shaping Program (PFSP). The speech of the treated stutterers and normal speakers were judged on 3 perceptual dimensions. These included Distorted Speech dimension (which included naturalness), Dynamics/Prosody dimension, and Voice dimension. Twenty naive listeners judged speech samples of 32 severe stutterers and 20 nonstutterers. Speech samples of the stutterers were obtained at pre-treatment, post-treatment, and half-year follow up. Instead of the scale developed by Martin et al., an instrument consisting of 14 seven-point bipolar semantic scales was used. Examples of the bipolar semantic scales include low pitch, high pitch; slow, quick; flat, expressive; and unnatural, natural. Findings revealed that the pre- and post-treatment

speech did not improve in terms of naturalness. Results also indicated that there were perceptual differences in the stutterers' speech at 6 months follow up as compared to their post-treatment speech. There was some improvement in the Dynamics/Prosody dimension in the stutterers' speech at 6 months follow up. There were also perceptual differences in the speech of the stutterers and nonstutterers. The post-treatment speech was found to be similar to the speech of normal speakers on the Distorted Speech dimension but not on the Dynamics/Prosody dimension. Franken et al. concluded that the results of this study were consistent with findings of previous studies demonstrating that listeners can differentiate between the speech of treated stutterers and nonstutterers (Ingham & Packman, 1978; Runyan & Adams, 1978, 1979; Runyan, Bell, & Prosek, 1990).

In the previous studies, ratings of speech naturalness were based on audiotaped speech samples. Martin and Haroldson (1992) examined if differences existed in naive listeners' speech naturalness ratings of stutterer's and nonstutterer's speech samples when raters were presented with audiovisual versus audio speech stimuli. One-minute samples were obtained and 24 raters were required to use the 9-point scale to judge each speaker's speech naturalness. Results showed that mean naturalness ratings for both the stutterer audiovisual and audio-samples were higher (i.e. more unnatural) as compared to the nonstutterer samples. In addition, mean ratings were

higher for the stutter-audiovisual samples than for the stutter-audio samples. Results also suggested a positive correlation between stuttering severity and speech naturalness; a negative correlation between word output and naturalness ratings; and a positive correlation between stuttering frequency and naturalness scores. Lastly, interrater reliability for the stutterer samples was high but it was lower for the nonstutterer samples. Martin and Haroldson stated that the reliability results seem consistent with the results from Martin et al. (1984). Furthermore, interrater agreement for groups of judges in this study was also determined to be high. The authors concluded that "rater agreement for groups of judges is sufficient to support use of the 9-point speech naturalness scale for group studies" (p. 527).

Modification of speech naturalness

Attempts have been made to investigate the potential usefulness of the 9-point rating scale developed by Martin et al. as a clinical tool in modifying speech naturalness of stutterers. Ingham, Martin, Haroldson, Onslow, and Leney (1985) investigated whether stutterers could modify their speech quality when they were provided with feedback regarding speech naturalness. Six stutterers were required to speak spontaneously while clinicians used the 9-point scale to rate the naturalness of the stutterer's speech. The clinicians were required to rate speech naturalness of 30 second speech

intervals. Findings showed that 5 of the 6 stutterers were able to lower their mean speech naturalness scores. Thus, five subjects were able to improve their speech naturalness when they were provided with feedback regarding their speech quality. Intra- and inter-rater reliability was high for this study. These results, therefore, lend additional support to the reliability of the 9-point scale and showed that speech naturalness may be a response class which can be manipulated.

Another study of speech naturalness as a manipulable response class was attempted by Ingham and Onslow (1985). The study involved three stutterers who were undergoing intensive prolonged speech treatment. Results demonstrated that the subjects were able to modify their speech naturalness when regular feedback of speech naturalness scores on their spontaneous speech was provided. Furthermore, the results suggested that the rating scale may be used to modify speech quality within a treatment context.

Ingham, Ingham, Onslow, and Finn (1989) evaluated the effects and reliability of stutterers' self-ratings of speech naturalness. The 9-point rating scale developed by Martin et al. was used in this study. Findings indicated that there were differences in the ratings between the stutterers and experimenter. Ingham et al. suggested that "stutterers may recognize changes in their own speech naturalness that are not apparent to other listeners..." (p. 430) and that they may be more analytical in their speech naturalness judgements.

Findings also indicated that the stutterers' ratings were highly reliable and further, that they were able to modify their speech naturalness ratings.

Validity of speech naturalness measures

A study by Metz, Schiavetti, and Sacco (1990) investigated the construct validity of scaling measures of speech naturalness and the relationship between acoustic characteristics and perceptual measures of speech naturalness. Audiotaped speech samples were obtained from 20 nonstutterers and 20 stutterers who completed a residential stuttering treatment program. Three groups of 5 listeners rated the samples using the scale developed by Martin et al. and the other three groups of 5 listeners used a direct magnitude estimation (DME) procedure (N = 30 raters). Group reliability coefficients for the interval scale were high and were consistent with the results from Martin et al. Group reliability coefficients were also high for the DME procedure. However, intra-rater reliabilities were lower than the inter-rater reliabilities for both interval and DME procedures. Results indicated that the nonstutterers were rated as more natural than the stutterers by both scaling methods. The results also revealed that voice onset time and sentence duration were parameters used by listeners to judge speech naturalness. Moreover, Metz et al. stated that "...the continuum of speech naturalness is metathetic [and] it can be concluded that either interval scaling or direct magnitude

estimation is an appropriate procedure for the measurement of this dimension" (p. 523).

It is evident that there are many studies which have examined the speech naturalness of stutterers. One common result from these studies is that the speech of stutterers who undergo treatment is perceptually different and more unnatural sounding than the speech of nonstutterers. However, perceived differences in the treated speech of stutterers does not necessarily indicate that their speech is unacceptable and not preferred by listeners (Martin, 1981; Franken et al., 1992).

Listener preference for stuttered and treated speech

It has been commonly believed that listeners' reactions to a child's dysfluencies was a factor in the onset of stuttering (Johnson, 1956). Johnson indicated that "...stuttering arose as a problem that involved the interaction of listener and speaker--that is, of the speaking child and those others...who listened and reacted evaluatively to his speech" (p. 261). Furthermore, it appears that listeners react negatively to the speech of stutterers and have negative stereotypes of stutterers (Bloodstein, 1987; Starkweather, 1987). It has been found that listeners negatively stereotype stutterers as being nervous, fearful, and insecure (Bloodstein, 1987). Thus, the responses of listeners to dysfluent speech has been an important notion in the area of stuttering. However, there appears to be fewer research studies in the area specific to listeners' preference

for the stuttered or treated speech of stutterers.

Mallard and Meyer (1979) examined listener preferences for stuttered or fluent syllable-timed speech. The researchers reported that stutterers expressed concern regarding negative reactions from listeners to syllable-timed speech and that this concern may affect maintenance of syllable-timed speech in a non-clinical environment. Videotaped reading samples were made of three stutterers who represented a range of stuttering severity. First, they were required to read in their stuttered speech pattern and then in syllable-timed rates of 70 and 100 words per minute. Twenty-three naive listeners were asked to indicate which speech pattern they preferred. Findings indicated that listeners preferred syllable-timed speech to stuttering for two of the three subjects. The researchers indicated that listeners may prefer stuttering if the syllable-timed speech is extremely slow, "staccato", or "machine-like". However, in this study, raters seemed to indicate a general preference for syllable-timed speech over stuttering.

Williamson, Epstein, and Coburn (1981) examined treatment effects of the regulated breathing method using a multiple baseline design. Although this study did not investigate listener preference for stuttered or treated speech, an attempt was made to evaluate listeners' social impression of the subject during baseline and treatment. A social validation procedure which required listeners (N = 3) to rate

5-minute speech samples on three subjective rating scales was used. The three scales measured the raters' ability to understand the subject, desire to interact with the subject, and global impression of the subject. Audio-taped speech samples were obtained during conditions where the subject was required to read aloud, participate in an interview with a clinician, role play a social situation, and speak on the telephone. Results indicated that the listeners' ratings improved as the subject's speech improved.

Franken et al. (1992) suggested that "acceptability" may be a valid criterion for assessing treatment results. They further suggested it is probable that the treated speech of stutterers, albeit "...relatively slow and unexpressive..." (p. 237), is more acceptable and effective in communication than speech which is severely stuttered.

Summary of literature review

It has been suggested that lucky fluency or uncontrolled speech may influence stutterers' use of speech controls. Thus, the continued use of uncontrolled speech and reliance on lucky fluency may lead to an increase in the magnitude of residual stutters which seem to play a role in relapse. Furthermore, stutterers' perception that treated speech is unnatural-sounding may also affect their willingness to use speech controls outside of the clinical environment.

It seems evident from the speech naturalness studies reviewed earlier that listeners are able to reliably quantify

speech naturalness of stutterers and nonstutterers and that they seem to perceive differences in the speech of these two groups of speakers. Furthermore, they seem to perceive that the speech of stutterers sounds more unnatural than the speech of nonstutterers. However, there was evidence to suggest that listeners preferred the treated speech of stutterers to their stuttered speech. It also appears that listeners' social impression of a stutterer improved as his speech improved during treatment. However, the listeners in the Williamson et al. (1981) study may not have used the speech quality of the subject as a basis for their ratings. Although their ratings improved as the subject's speech improved, this does not necessarily imply that they judged his speech to be acceptable (Onslow & Ingham, 1987) or that they preferred his treated speech over his stuttered speech.

As previously indicated, there appears to be a paucity of research in the area of uncontrolled speech of treated stutterers. Most of the speech naturalness studies previously discussed examined the fluent speech of stutterers who were undergoing treatment or who had recently completed treatment. There appears to be a lack of studies which investigate speech naturalness of the post-treatment uncontrolled speech of stutterers. It seems important to investigate how listeners perceive the uncontrolled speech of treated stutterers and how it compares to their controlled speech in terms of naturalness. Studies investigating "...relative perceived

abnormality of controlled and noncontrolled speech by nonbiased listeners...seems essential" (Boberg et al., 1979, p. 112). Furthermore, it also seems important to investigate listener preference for controlled or uncontrolled speech. These seem to be important areas of investigation because of their clinical implications and possible role in the maintenance of controlled speech after stuttering treatment.

CHAPTER III

METHODOLOGY

In this chapter, the purpose, subjects, speakers, speech samples, and procedures are discussed.

Statement of purpose

The purpose of this study was to answer the following questions:

1) Is there a difference in naive judges' naturalness ratings of the post-treatment uncontrolled speech (containing stutters) of stutterers, the post-treatment controlled speech of stutterers, and the speech of normal speakers?

2) Is there a difference in likeability (i.e. preference) ratings of the post-treatment uncontrolled speech of stutterers, post-treatment controlled speech of stutterers, and the speech of normal speakers?

Subjects

Thirty undergraduate students who had no professional training in speech pathology served as volunteer subjects for this study. The majority of the judges were female and they ranged in age from 19 years to 25 years old. These subjects acted as naive judges for the rating tasks. Subjects were recruited through the placement of advertisements in the university newspaper, postings around campus, and personal contacts.

Speech samples

Speakers required for speech samples

Two groups of volunteer speakers were required for the production of the audiovisual speech stimuli. One group of speakers were adult male stutterers (Group A, N = 3). The following criteria was used to select Group A speakers:

1) the speakers had completed an intensive stuttering clinic at the Institute for Stuttering Treatment and Research (ISTAR) within the last 3 years (see Appendix A for a brief description of the treatment program).
2) the speakers had been diagnosed as mild to moderate stutterers during the pre-treatment assessment.
3) the speakers demonstrated stutters in their uncontrolled speech.
4) the speakers demonstrated the ability to use controlled speech (a description of controlled speech is provided below).
5) the speakers had no other communication disorder aside from stuttering.
6) the speakers were native speakers of English.
7) the speakers lived within the Edmonton area.

The second group of speakers were normal speaking adult males (Group B, N = 3). The following criteria was used to select Group B speakers:

1) the speakers did not have any communication disorders.
2) the speakers were native speakers of English.

3) the speakers lived within the Edmonton area.

Group A and B speakers were matched on gender and race. Both groups of speakers were also similar in age (i.e. +/- 5 years). Both groups of speakers ranged in age from 21 years to 34 years old.

Lastly, a normal speaking individual was required to act as a volunteer conversational partner with each of the speakers in Groups A and B. This individual was unfamiliar with the speakers and with the ISTAR, and is referred to as the conversational partner (CP). Furthermore, the CP was an individual who possessed good interpersonal skills and who was able to ask questions and converse in an encouraging and non-dominating manner.

Recruitment of speakers

Group A speakers were clients or former clients of the ISTAR. These individuals were identified through clinic files and ISTAR staff recommendations. The experimenter recruited Group B speakers and the CP through personal contacts.

Group A and B speakers were required to sign a consent form prior to audiovisual recording of the speech samples (see Appendix B and C).

Tasks: Group A

The stutterers were asked to speak in two conditions:

1) uncontrolled speech which contained stutters and

2) controlled speech containing no stutters.

Speakers conversed with the CP until the above conditions were

met. A total of approximately 15 to 20 minutes of talk time was required from each speaker for each speaking condition. Each individual was asked to have a conversation with the CP for both speaking conditions.

Task: Group B

Individuals in Group B were required to speak in only one condition: normal speech. A total of 5 to 10 minutes of talk time was required from each individual during the conversation with the CP.

Materials/Equipment

A video camera, tripod, lapel microphone, and videotapes were required for the production of the speech samples. Written and oral task instructions for Group A and B speakers were provided.

The experimenter also provided the CP with a list of conversational topics. These included job description, hobbies, and interests. The CP was asked to begin each conversation with the same topic for each speaker and proceed until the required talk time of conversational speech was obtained.

Location

The audiovisual recording of the uncontrolled, controlled, and normal speech samples took place in a quiet room at Corbett Hall.

Uncontrolled speech sample

The uncontrolled speech sample was obtained first from

each speaker in Group A prior to obtaining the controlled speech sample. For the uncontrolled speech sample, the individuals were asked to speak without using any "controls" acquired in therapy, such as fluency skills and prolonged speech which facilitate fluency (i.e. individuals were asked to speak spontaneously). They were asked to speak using an uncontrolled speech pattern. When stutterers speak without using "controls", stutters tend to occur in their speech.

If a speaker did not exhibit stutters in his uncontrolled speech, the experimenter did one of the following:

1) stopped the video-recording and repeated the instructions
2) recorded the uncontrolled speech sample at a later time
3) asked the speaker to describe and simulate his typical stuttering behaviors for the uncontrolled speech sample.

A summary of the characteristics of the post-treatment uncontrolled speech samples of the Group A speakers, which includes a measurement of the frequency of stuttering (%SS) and a description of the secondary or accessory behaviors, is presented in Appendix D (Wingate, 1964).

Controlled speech sample

For the controlled speech sample, the individuals were asked to speak while using "controls" acquired in therapy, such as fluency skills and prolongation which facilitate fluent speech. The speakers were asked to speak in a controlled speech pattern. Prior to the video-recording of

the controlled speech sample, the experimenter briefly reviewed and practiced the fluency skills and prolongation with each speaker. Fluency skills are techniques which stutterers use to control their speech. These skills involve the speaker controlling the respiratory, phonatory, and articulatory systems. Fluency skills are used with a slower, prolonged, and controlled rate of speech (Boberg & Kully, 1985). This review and practice was approximately 10 minutes in length. Additional training was necessary for one speaker who had difficulty producing controlled speech during the initial taping of the speech sample. Further training involved a more detailed review and practice of the fluency skills and prolongation. It was also necessary for the experimenter to provide cuing and feedback during the video-recording of the speech sample in order to facilitate the individual's use of controlled speech. There was minimal cuing and coaching from the experimenter in order to maximize the naturalness of the communication between the speakers and the CP.

Stimulus tape

Upon completion of the video-recording of all the speech samples, one-minute speech segments were dubbed from each speaker's speech sample onto a master tape.

Two speech segments were dubbed from each speaker. One speech segment was dubbed from the stutterer's controlled speech sample; one speech segment was dubbed from the

uncontrolled speech sample of that same stutterer; and two speech segments were dubbed from the speech sample of the normal speaker. This was done for every speaker. There were 12 dubbed speech segments in total (i.e. two for every speaker). Two speech segments were required from the Group B speakers in order to keep the number of segments consistent with those of Group A. The speech segments were then randomized onto the master tape. This master tape was used as the stimulus tape. There was approximately 7 seconds of blank tape in between each speech segment on the stimulus tape. It appears that 7 seconds gave the raters enough time to rate each speech segment (Manz, 1988). The appropriate sample number was recorded prior to each speech segment to indicate its chronological position on the stimulus tape.

Validity of speech samples

Agreement between two clinicians from the ISTAR and the experimenter was determined in order to verify that the stutterers had used uncontrolled and controlled speech. This was done for the stutterers' use of controlled-sounding speech; use of uncontrolled-sounding speech; and for the identification of stutters in the uncontrolled speech.

A percentage of uncontrolled speech use (%UCS) was obtained for each uncontrolled speech segment. The %UCS was obtained by dividing the total number of utterances which consisted of UCS into the total number of utterances in the UCS segment and multiplying the result by 100. Furthermore,

stutters in the uncontrolled speech were identified and counted and a %SS was obtained. This value was determined by dividing the total number of dysfluencies into the total number of syllables spoken and multiplying the result by 100 (Boberg & Kully, 1985).

A percentage of controlled speech use (%CS) was obtained for each controlled speech segment. The %CS was obtained by dividing the total number of utterances which consisted of CS into the total number of utterances in the CS segment and multiplying the result by 100. A percentage agreement among the individuals was then determined and expressed in terms of the Pearson Product Moment Correlation Coefficient.

PROCEDURES FOR JUDGES

Materials

The judges used the 9-point speech naturalness scale developed by Martin et al. (1984) to rate the speech naturalness of the speakers. This scale was chosen because of its reported high interrater reliability and rater consistency (Ingham et al., 1985a; Ingham et al., 1985b; Martin & Haroldson, 1992; Martin et al., 1984; Metz et al., 1990).

The judges used another 9-point scale to indicate their preferred speech pattern (1 = most like listening to; 9 = least like listening to).

Tasks

The speech naturalness rating task was similar to the general procedure outlined by Martin et al. (1984). Listeners

sat in a quiet room at Corbett Hall when rating the speech samples. They were given a packet of sheets containing the instructions and rating scales (see Appendix E for the speech naturalness instructions, Appendix F for the speech likeability instructions, and Appendices G and H for the rating scales). Both oral and written instructions were provided to the raters. The raters were given time to peruse the instructions and to ask the experimenter questions pertaining to the tasks. The videotape was then activated and the speech segments appeared on a television monitor. The stimulus tape was played from beginning to end non-stop. Three speech segments were used as "practice ratings" prior to the actual rating tasks. The judges were required to rate the speech naturalness of all the speech segments from the stimulus tape. After the judges rated speech naturalness of all the samples, they were required to provide written answers to open-ended questions regarding their judgements of speech naturalness (see Appendix I).

Upon completion of this task, the judges were given a 5 minute break. After the break, another packet of sheets containing instructions and rating scales were given to the judges for the preference (likeability) rating task. After the judges read and indicated they understood the instructions, another videotape with randomized speech segments was played non-stop. The judges were then required to rate their preference (ie. likeability) for all of the

speech segments from the second stimulus tape. The second stimulus tape included the same speech samples as the first tape but in a different randomized order. After the judges rated preference (likeability) for all the speech samples, they were asked to provide written answers to open-ended questions regarding their judgements of speech likeability (see Appendix J). The entire task required approximately forty minutes to complete.

Design

This study took the form of a comparative within-group design.

Variables

The speaking conditions constituted the independent variable. There were three levels:

1) uncontrolled speech of stutterers
2) controlled speech of stutterers
3) speech of normal speakers

The dependent variables were the speech naturalness and preference (ie. likeability) ratings for each speaking condition.

CHAPTER IV

RESULTS OF STUDY

The purpose of this study was twofold. The first purpose was to investigate naive judges' speech naturalness ratings for the post-treatment uncontrolled and controlled speech of stutterers and the speech of normal speakers. The second purpose was to investigate naive judges' likeability ratings for the post-treatment uncontrolled and controlled speech of stutterers and the speech of normal speakers.

Results are reported in five sections. Section 1 discusses the results for intra- and inter-rater reliability. Section 2 discusses the results of attempts to verify the validity of the uncontrolled and controlled speech samples. Section 3 discusses descriptive statistics for the variables. In section 4, the results of the analyses of variance (ANOVAs) are reported. In section 5, the judges' answers to the speech naturalness and speech likeability questions are reported.

Reliability

Intra-rater reliability

Intra-rater reliability was expressed in terms of rate-rerate agreement. Twenty percent of the judges (i.e. 6 judges) were required to re-rate the speech samples in terms of speech naturalness and likeability at least one week after their initial rating session. The initial rating was then compared to the second rating for each speech sample and a percentage agreement for values which were the same or +/-1 value of each

other was calculated. This was done for both speech naturalness and speech likeability values. Tables 1 and 2 show the intra-rater reliability values (i.e. percentage agreement values) for speech naturalness and speech likeability respectively. Reliability for the individual judges was determined to be moderate to high.

Table 1. Intra-rater reliability: Percentage agreement values for speech naturalness

Raters	Percentage agreement
R23	100%
R29	88.89%
R2	100%
R13	66.67%
R25	88.89%
R30	77.78%

Note. Mean = 87.04% agreement, Standard deviation = 12.99

Table 2. Intra-rater reliability: Percentage agreement values for speech likeability

Raters	Percentage agreement
R23	77.78%
R29	77.78%
R2	88.89%
R13	88.89%
R25	77.78%
R30	66.67%

Note. Mean = 79.63% agreement, Standard deviation = 8.36

Inter-rater reliability

Inter-rater reliability was expressed by the intraclass correlation coefficient (ICC) which is determined by an ANOVA (Winer, 1971). Inter-rater reliability for speech naturalness was R = 0.998 and inter-rater reliability for speech likeability was R = 0.997. Reliability among the judges in this study was therefore determined to be very high.

Validity of speech samples

To verify that the speakers in the study had used uncontrolled and controlled speech in each speech segment, percentage agreements between two clinicians from the ISTAR and the experimenter were obtained for each stutterers' use of uncontrolled-sounding speech (which contained stuttering), use of controlled-sounding fluent speech, and for the

identification of stutters in the uncontrolled speech samples. A percentage of uncontrolled speech use (%UCS), percentage of controlled speech use (%CS), and percentage syllables stuttered (%SS) was calculated for the speech segments by the two clinicians and the experimenter.

The %UCS was obtained by dividing the total number of utterances which consisted of UCS into the total number of utterances in the UCS speech segment and multiplying the result by 100. The %CS was obtained by dividing the total number of utterances which consisted of CS into the total number of utterances in the CS speech segment and multiplying the result by 100. The %SS was obtained only for the uncontrolled speech segments. This value was determined by dividing the total number of stutters into the total number of syllables spoken and multiplying the result by 100 (Boberg & Kully, 1985).

Agreement among the individuals was then determined and expressed in terms of the Pearson Product Moment Correlation Coefficient. The coefficient values for the %UCS, %CS, and %SS are presented in Tables 3, 4, and 5.

Table 3. Agreement between 2 clinicians and experimenter: Pearson coefficients for %UCS

	Clinician 1	Clinician 2	Experimenter
Clinician 1		r = 1	r = 0.962
Clinician 2			r = 0.963

Table 4. Agreement between 2 clinicians and experimenter: Pearson coefficients for %CS

	Clinician 1	Clinician 2	Experimenter
Clinician 1		r = 1	r = 1
Clinician 2			r = 1

Table 5. Agreement between 2 clinicians and experimenter: Pearson coefficients for %SS

	Clinician 1	Clinician 2	Experimenter
Clinician 1		r = .987	r = .97
Clinician 2			r = 0.997

Descriptive results

The mean, standard deviation, variance, mode, and range of ratings for the uncontrolled speech segments (UCS), controlled speech segments (CS), and normal speech segments (NS) are reported in Table 6 for speech naturalness and Table 7 for speech likeability. From the descriptive results, evidence of differences in the mean speech naturalness and mean speech likeability values among the three speaking conditions was found. This finding will be further discussed in the ANOVA section.

Table 6. Descriptive statistics for speech naturalness: Mean, standard deviation, variance, mode, and range for UCS, CS, and NS

	Uncontrolled	Controlled	Normal
Mean	7.333	3.744	1.544
Std. Dev	1.091	1.719	0.823
Variance	1.191	2.956	0.678
Mode	8	3	1
Range	5	6	4

Table 7. Descriptive statistics for speech likeability: Mean, standard deviation, variance, mode, and range for UCS, CS, and NS

	Uncontrolled	Controlled	Normal
Mean	7.678	4.622	1.744
Std. Dev	1.235	2.014	1.045
Variance	1.524	4.058	1.091
Mode	9	5	1
Range	5	8	4

Analysis of variance (ANOVA) results

A one factor analysis of variance (repeated measures) was performed for each dependent variable. Results of the ANOVA for the speech naturalness values are presented in Table 8 and the results of the ANOVA for the speech likeability values are presented in Table 9. Post hoc analyses were also performed

for each dependent variable. Results of the post hoc analyses are reported in Table 8 for the speech naturalness ratings and Table 9 for the speech likeability ratings.

Table 8. One factor analysis of variance (repeated measures) for speech naturalness

Source	df	SS	MS	F-test	P-value
Between subjects	89	216.385	2.431	.25	1
Within subjects	180	1750	9.722	-	-
Treatments	2	1536.941	768.47	642.017	.0001
Residual	178	213.059	1.197	-	-
Total	269	1966.385	-	-	-

Note. df = degrees of freedom
SS = sum of squares
MS = mean square

Post hoc analysis:

Comparison	Mean difference	Scheffe
SNAT-UCS vs. SNAT-CS	3.589	242.115*
SNAT-UCS vs. SNAT-NS	5.789	629.93*
SNAT-CS vs. SNAT-NS	2.2	90.98*

Note. *Significant at 95%
SNAT-UCS = Speech naturalness value for uncontrolled speech.
SNAT-CS = Speech naturalness value for controlled speech.
SNAT-NS = Speech naturalness value for normal speech.

Table 9. One factor analysis of variance (repeated measures) for speech likeability

Source	df	SS	MS	F-test	P-value
Between subjects	89	279.941	3.145	.289	1
Within subjects	180	1898.667	10.548	-	-
Treatments	2	1584.674	792.337	449.17	.0001
Residual	178	313.993	1.764	-	-
Total	269	2178.607	-	-	-

Note. df = degrees of freedom

SS = sum of squares

MS = Mean square

Post hoc analysis:

Comparison	Mean difference	Scheffe
SL-UCS vs. SL-CS	3.056	119.087*
SL-UCS vs. SL-NS	5.933	449.035*
SL-CS vs. SL-NS	2.878	105.633*

Note. *Significant at 95%

SL-UCS = Speech likeability value for uncontrolled speech.

SL-CS = Speech likeability value for controlled speech.

SL-NS = Speech likeability value for normal speech.

Results of the ANOVA for the speech naturalness values indicate that significant differences exist in the mean speech naturalness ratings assigned to the uncontrolled, controlled,

and normal speech samples ($F = 642.02$, $df = 2, 89$, $p < .05$). Post hoc analysis (Scheffe F-test) indicated that significant differences in speech naturalness ratings exist between all three speaking conditions ($p < .05$). The post-treatment uncontrolled speech samples (i.e. stuttering) received higher naturalness ratings (i.e. were rated as more "unnatural") than the controlled speech (i.e. fluent) and normal speech samples. Furthermore, the controlled speech of stutterers was rated as more unnatural sounding than the speech of normal speakers.

Results of the ANOVA for the speech likeability values reveal that differences between the mean ratings assigned to the three speaking conditions were statistically significant ($F = 449.17$, $df = 2, 89$, $p < .05$). Post hoc analysis (Scheffe F-test) revealed that differences in speech likeability ratings assigned to all three speaking conditions were statistically significant as well ($p < .05$). Post-treatment uncontrolled speech received higher speech likeability values (i.e. were rated as "least like listening to") than both the controlled and normal speech samples. Furthermore, the controlled speech of stutterers received higher speech likeability ratings (i.e. were rated as "least like listening to") than the speech of normal speakers.

A noteworthy finding of the present study is that 97% of the controlled speech segments were rated as more natural than the uncontrolled speech segments. On a related note, 90% of the controlled speech segments received more "most like

listening to" than the uncontrolled speech segments which contained stuttering.

Speech naturalness answers

Analysis of the judges' answers to the speech naturalness questions indicated that common descriptors were used to describe characteristics of the speakers' speech which influenced their ratings.

Answers to the speech naturalness questions revealed that the main speech characteristics which led judges to rate the speakers' speech as sounding "natural" included: normal-sounding intonation, normal-sounding speech rate, clarity of speech, and natural flow and rhythm of speech. The descriptors "normal-sounding intonation" and "normal-sounding speech rate" were used by sixty percent of the judges, "clear and intelligible speech" was used by 30% of the judges, and "a steady flow of words and natural rhythm" was used by 27% of the judges to indicate speech characteristics which influenced their "naturalness" ratings.

The main characteristics which led the judges to rate a speaker's speech as "unnatural" included: the presence of stuttering, unusual speech rate, monotonous speech, and speech which contained too many pauses or breaks. The descriptors "speech containing stuttering" and "too slow or fast speech rate" were used by seventy percent of the judges, "monotonous sounding speech" was used by 47% of the judges, and "speech containing too many pauses and breaks" was used by 40% of the

judges to indicate speech characteristics which influenced their "unnaturalness" ratings.

Speech likeability answers

Analysis of the judges' answers to the speech likeability questions indicated that common descriptors were used to describe characteristics of the speakers' speech which influenced their ratings.

Answers to the speech likeability questions revealed that the main characteristics which led judges to rate a speaker's speech as "most like listening to" included characteristics which were the same as those mentioned above. These included normal-sounding intonation, normal-sounding speech rate, and clarity of speech. The descriptor "normal-sounding intonation" was used by 63% of the judges, "consistent and normal-sounding speech rate" was used by 53% of the judges, and "clear and intelligible" was used by 50% of the judges to indicate speech characteristics which influenced their "most like listening to" ratings.

The main characteristics which led the judges to rate a speaker's speech sample as "least like listening to" included monotonous speech, the presence of stuttering, unusual speech rate, and breaks in the flow of speech. The descriptor "monotonous speech" was used by 60% of the judges, "stuttering" was used by 57% of the judges, "unusual speech rate" was used by 50% of the judges, and "speech which contained too many or too long of pauses or breaks" was used

by 33% of judges to indicate speech characteristics which influenced their "least like listening to" ratings.

CHAPTER V

DISCUSSION AND IMPLICATIONS

In the present study, an attempt was made to examine whether differences exist in naive judges' speech naturalness ratings of stutterers' post-treatment uncontrolled speech (which contained stutters), controlled speech, and the speech of normal speakers. An attempt was also made to examine whether differences exist in naive judges' speech likeability ratings of stutterers' UCS, CS, and the speech of normal speakers.

Thirty naive judges were required to rate speech naturalness and likeability (i.e. preference) for post-treatment uncontrolled speech, post-treatment controlled speech, and normal speech.

Findings

Perceived naturalness and likeability of controlled speech

An important finding of the present study was that a group of naive judges rated samples of the post-treatment controlled fluent speech of stutterers as sounding more natural than post-treatment uncontrolled speech (which contained stutters). Ninety-seven percent of the controlled speech segments received lower speech naturalness ratings (i.e. were rated as more natural) than the uncontrolled speech segments. Moreover, 90% of the controlled speech segments received lower speech likeability ratings (i.e. were rated as more likeable) than the uncontrolled speech segments.

Interestingly, these results do not lend support to previous studies on speech naturalness (Franken et al., 1992; Kalinowski, Noble, Armson, & Stuart, 1994). Franken et al. found that a significant difference did not exist in the speech naturalness of the pre- and post-treatment speech of severe stutterers. Similarly, Kalinowski et al. (1994) found that a group of judges rated the pre-treatment speech of mild and severe stutterers as sounding more natural than their post-treatment speech. Several factors may account for the difference in results between the present study and the two related studies. These may include differences in the nature of the speech samples, group of judges, speakers, occasion of speech sampling, type of speech sampled (e.g. post-treatment uncontrolled speech versus pre-treatment speech), and type of stuttering treatment program.

When judges were asked to rate likeability or preference in the present study, they indicated that they liked to listen to post-treatment controlled speech more than they liked to listen to post-treatment uncontrolled speech. This finding is consistent with the results from Mallard and Meyer (1979) where listeners preferred to hear fluent syllable-timed speech over speech which contained stuttering. This is a noteworthy finding due to its clinical implications which will be discussed later.

Controlled and uncontrolled speech compared to normal speech

Findings of this study also revealed that judges rated

post-treatment controlled speech as sounding more unnatural than the speech of normal speakers. Results from this study also indicated that judges rated the post-treatment uncontrolled speech of stutterers as more unnatural sounding than both controlled and normal speech. These findings are not particularly surprising. Findings from other studies have shown that raters were able to distinguish between the post-treatment fluent speech of stutterers and the speech of normal speakers (Franken et al., 1992; Harrold & Murdoch, 1986; Ingham & Packman, 1978; Runyan & Adams, 1978, 1979). Moreover, results from other studies have revealed that raters perceived the post-treatment speech of stutterers to sound more unnatural when compared to the speech of normal speakers (Ingham et al., 1985; Martin et al., 1984; Martin & Haroldson, 1992; Onslow et al., 1992; Runyan et al., 1990). The findings of the present study therefore are consistent with the results of previous research.

Reported characteristics of controlled and uncontrolled speech which influenced naturalness and likeability ratings

When judges were asked to provide answers to open-ended questions regarding speech naturalness and likeability, they revealed that common speech characteristics which influenced their "naturalness" and "likeability" ratings included speech rate, intonation, presence of stuttering, clarity, and flow of speech. Judges expressed that speech which sounded too fast or too slow and monotonous was rated as unnatural and least

liked. This finding parallels the results of the study by Mallard & Meyer (1979) where listeners indicated that they did not like listening to the fluent syllable-timed speech of stutterers which sounded too slow or robotic.

Findings of other studies have suggested that speech rate may be the primary cue used by listeners to differentiate between the speech of treated stutterers and normal speakers (Metz et al., 1979; Runyan & Prosek, 1982, 1983). Furthermore, Metz et al. (1990) suggested that voice onset time (VOT) and sentence duration (which are reflections of speech rate) were variables used by listeners to judge speech naturalness. In addition, Harrold and Murdoch (1986) found that prosody and speech rate were the primary characteristics which were used by listeners to perceptually distinguish the fluent speech of treated stutterers from the speech of normal speakers. Thus, it appears that speech rate and prosody are common variables which affect listeners' perception of speech naturalness. However, Ingham and Packman (1978) demonstrated that although stutterers in their study achieved fluent speech with a speech rate that was within normal range (170 to 210 syllables per minute), some listeners were still able to confidently describe the speech as that of either a stutterer or normal speaker. Therefore, it seems that research findings in the area of variables or determiners of speech naturalness are inconclusive.

The presence of stuttering also seemed to be a factor in

the judges' evaluation of speech naturalness and speech likeability in the present study. Judges indicated that speech which contained stuttering sounded unnatural and that they did not like listening to it. It is interesting to note that some judges expressed that it was painful to listen to and watch the stutterers and that it was frustrating for them to wait for the speaker to get through his stuttering block. In addition, some judges also reported that it was frustrating and difficult for them to try to understand the speaker during a stuttering block. Again, this appears to be an important finding due to its clinical significance which will be discussed later.

Variance

Another finding from the present study was that the variance for the speech naturalness and likeability ratings for controlled speech was quite large. It seems that, as a group, the judges agreed that controlled speech sounds more natural than uncontrolled speech. However, the high variance values suggest that there may be differences in the judges' absolute ratings of speech naturalness and likeability of controlled speech. Some of the variation in absolute values may be due to individuals using different standards to judge the speakers' controlled speech on the domains of naturalness and likeability. Furthermore, speech naturalness and likeability are subjective notions. There appears to be no objective criteria provided to judges on which to base their

judgements. In addition, differences among speakers' controlled speech characteristics may have an effect on judges' naturalness and likeability or preference ratings. Although the variance values for controlled speech were high, significant differences and high reliability were obtained in the present study.

Reliability

Another finding from this study was that the inter-rater reliability for speech naturalness and likeability was determined to be very high. Inter-rater reliability values in this study are comparable to values from other studies. Table 10 presents a comparison of reliability values for speech naturalness of the present study and other studies.

Table 10. Comparison of reliability values for speech naturalness from present study and related studies

Study	Intra-rater	Inter-rater
Martin et al. (1984)	R = 0.74	R = 098
Metz et al. (1990)	R = 0.695	R = 0.982
Onslow et al. (1992)	72.4%	59.2%
Schiavetti et al. (1994)	R = 0.935	R = 0.997
Present study	87.04%	R = 0.998

Note. Intra- and inter-rater reliability were expressed by percentage agreement values in the Onslow et al. (1992) study. Intra-rater reliability was expressed by percentage agreement and inter-rater reliability was expressed by the intraclass

correlation coefficient (ICC) in the present study. Intra- and inter-rater reliability was expressed by the ICC in the other studies.

There seem to be a difference in inter-rater reliability values among the studies. This may be due to the differences between the studies in terms of methodology, reliability of raters, type and occasion of the speech samples, type of treatment, and idiosyncracies of the raters.

The values for intra-rater reliability were lower than the inter-rater reliability values for both dependent variables. This is consistent with the notion that the nine-point speech naturalness rating scale is a reliable measure of speech naturalness for group studies. However, more research is needed to determine if the scale is a reliable speech naturalness measure for individual raters (Martin et al., 1984; Martin et al., 1992).

IMPLICATIONS

The results of the present study appear to be clinically significant. One of the greatest challenges for clinicians who work with stutterers is to encourage and convince clients to maintain the use of controlled speech after treatment has been terminated. Therefore, the results of this study may be useful in counselling clients regarding attitudes, beliefs, and behavior change after stuttering treatment.

Previous studies have suggested that the post-treatment

controlled speech of stutterers sounds perceptually different from the speech of normal speakers and that stutterers may be reluctant to use their post-treatment fluent speech due to its unnaturalness and negative reactions from listeners (e.g. Onslow & Ingham, 1987). However, in the present study, although listeners perceived controlled speech to sound more unnatural than normal speech, they rated controlled speech as more likeable than speech which contained stuttering (i.e. uncontrolled speech). It appears that although judges rated controlled speech as sounding more unnatural than normal speech, as a group, they liked to listen to controlled speech over uncontrolled speech which contained stuttering. Furthermore, judges reported that they found it difficult to watch an individual stutter, particularly if he exhibits secondary behaviors. Thus, it seems that stuttering may be frustrating and painful not only for the speaker, but for the listener as well.

Importantly, the mean speech naturalness and speech likeability values for controlled speech suggested that many judges in this study appeared to perceive controlled speech to be closer to normal speech in terms of speech naturalness and likeability then they perceived uncontrolled speech to be. This is encouraging information which may imply that the techniques for controlled speech used by the speakers in this study may be perceived by listeners to be more normal-sounding. It may also imply that the judges in this study

liked to listen to the controlled speech techniques used by the stutterers nearly as much as they would like listening to a normal speaker. Thus, results from this study may be useful in supporting clients to use controlled speech rather than revert back to using uncontrolled speech or rely on spontaneous fluency (i.e. lucky fluency) after stuttering therapy.

LIMITATIONS

The clinical implications and generality of the findings must be considered in light of the limitations of this study.

One limitation in the present study was the choice of the speakers. The ideal would be to use a random sample of stutterers and normal speakers; however, only volunteer subjects were available. Therefore, the speakers in this study were not randomly selected. It is also important to note that the post-treatment uncontrolled speech of the speakers in this study contained stuttering and secondary behaviors. It is not known whether this type of speech is representative of post-treatment uncontrolled speech for all stutterers. At the present time, no research exists that describes post-treatment uncontrolled speech.

Another limitation was the size of the speaker samples. Only three stutterers and three normal speakers were used in the present study. Due to the small size of the speaker samples, the results of this study may be difficult to generalize to a larger population. However, a larger speaker

sample may be a disadvantage as well. A larger speaker sample may increase the variability due to other factors that raters respond to in judgements of speech naturalness and likeability. Therefore, a smaller speaker sample may be advantageous by reducing the extraneous factors.

Another limitation was that because audiovisual speech samples were used, the judges may have based their judgements on variables which may have confounded the results. Such variables may have included the physical appearance of the speaker, voice characteristics, and articulation characteristics although judges were instructed to ignore such factors when making their ratings. The results of a study by Martin and Haroldson (1992) indicated that mean speech naturalness ratings were higher (i.e. rated as more unnatural) for stutterer-audiovisual speech samples than for stutterer-audio speech samples.

RECOMMENDATIONS FOR FUTURE RESEARCH

Several recommendations can be made regarding future research in the area of listeners' perception of stutterers' post-treatment speech:

A similar study can be carried out to determine if the results from the present study are replicable and to further determine the reliability of the speech likeability scale. Further research is still necessary in the area of stutterers' post-treatment uncontrolled and controlled speech.

Furthermore, a different group of speakers can be used to

determine if similar speech naturalness and likeability values are obtained. For example, female stutterers may be used. Also, a future study may include speakers with different levels of stuttering severity and different lengths of time since he or she last received therapy.

Additional research may include investigation into stutterers' judgements of speech naturalness and likeability of their own post-treatment speech. It would be of interest to examine how stutterers perceive the speech quality of their own speech and how their evaluation compares to the judgements of naive listeners.

Future research could also give further consideration to the parameters or variables of speech naturalness of the fluent speech of treated stutterers as results in this area are still inconclusive. Additional speech characteristics related to speech naturalness could also be investigated. Moreover, the primary characteristics which affect speech naturalness could be further examined to determine if clinicians are able to use these characteristics with clients or teach them to clients in order to maintain naturalness without compromising fluency.

On a related note, more research on the idiosyncrasies of controlled speech use between speakers appears to be needed. Important questions to consider would include: Which features make one speaker's treated speech sound more natural than another's? Can we eliminate unnecessary features and still

maintain speech naturalness without compromising fluency? Research related to this area has already begun (Packman, Onslow, & Van Doorn, 1994). The stutterers in Packman et al.'s study learned prolonged speech without programmed instruction in how to produce prolonged speech. The researchers found that the speakers produced natural sounding stutter-free speech although they used only certain features of prolonged speech.

The above seem to be important areas to research. Future research in these areas will contribute to a better understanding of stuttering, speech naturalness, listener perceptions of the treated speech of stutterers, and to improved stuttering treatment and more natural sounding post-treatment speech. Further consideration into these issues may also bring researchers a step closer to a better understanding of stutterers' post-treatment speech and its role in maintenance and relapse.

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APPENDIX A

ISTAR TREATMENT PROGRAM

A detailed description of the treatment program used at the ISTAR is provided in Boberg and Kully (1985). The following is only a brief outline of the program. The program has been revised during the course of this study.

Phase I: Group Orientation

The purpose include:
a) introduce the clients to the components of the program
b) prepare the clients for their responsibilities in the three-week intensive clinic.

The steps include:
1) information for clients
2) speech measurement
3) explanation of the measurement system, calculation of rate and stuttering scores.

Phase II: Identification

The purposes include:
a) develop client's awareness of normal speech processes and stuttering
b) teach clients to identify and describe stuttering behavior

The steps include:
1) information for clients
2) simulation of stutters
3) identification and description of stutters

Phase III: Introduction to Fluency Skills

The purpose includes:
a) introduce the fluency skills that will be developed during prolongation

The steps include:
1) information for clients
2) preliminary relaxation exercises
3) vowels in isolation
4) consonant-vowel combinations
5) mono- and polysyllabic words
6) phrases and sentences

Phase IV: Prolongation

The purpose is to develop prolonged speech at 60 + 20 spm using the fluency skills.

The steps include:
1) information for clients
2) prolongation at 60 spm
    i) develop sustained prolongation at 60 spm
    ii) develop short phrases of two to six syllables
    iii) soft phrase onsets/gentle starts
    iv) soft contacts/light touches
    v) self-assessment test

Phase V: Rate increase and Cancellation/Self-correction

The purposes include:
a) gradually increasing the rate of speech to develop normal-sounding controlled speech
b) develop self-correction and rate change skills
c) develop appropriate eye contact
d) develop appropriate attitudes

The steps include:
1) prolongation at 90 ± 20 spm
2) prolongation at 120 ± 20 spm
3) prolongation at 150 ± 20 spm
4) prolongation at 190 ± 20 spm
5) avoidance reduction
6) attitude sessions and self-talk

Phase VI: Self-monitoring and Transfer training

The purposes include:
a) develop self-monitoring skills at normal speaking rates
b) develop further rate change skills

The steps include:
1) self-monitoring sessions
2) rate changes
    i) therapist-directed
    ii) client-directed
3) social training

Phase VII: Transfer

The purposes include:
a) transfer normal-sounding controlled speech to non-clinical environments

b) further develop self-analysis skills

The steps include:
1) information for clients
2) transfer assignments
    i) standard assignments
    ii) personalized assignments

Upon completion of the phases of the program, clients are aided in preparing a personal maintenance plan. The plan is designed to facilitate long-term maintenance of the gains made in therapy.

APPENDIX B

RESEARCH CONSENT FORM FOR GROUP A SPEAKERS (Department of Speech Pathology and Audiology)

Consent form for study entitled: "Judges' evaluations of the post-treatment speech of stutterers and the speech of normal speakers".

You are being invited to participate in a research project about judges' perceptions of naturalness of stuttered and fluent speech and judges' preference or likeability for stuttered and fluent speech. It is being conducted by Connie Lam, a graduate student in the Department of Speech Pathology and Audiology at the University of Alberta. The project is supervised by Dr. Einer Boberg from the Department of Speech Pathology and Audiology. If you give your consent, two audiovisual recorded samples will be made of your speech while you converse with a volunteer stranger.

First, you will be required to speak without using any fluency skills or prolongation (ie. speak spontaneously using uncontrolled speech). That is, make no attempt to control your speech or stuttering. As you are conversing, an audiovisual recording of your uncontrolled speech will take place either at Corbett Hall or in a home.

Second, you will be required to speak while using fluency skills and prolongation (ie. controlled speech). As you are speaking, an audiovisual recording will be made of your controlled speech. Video-recording will take place at the Institute for Stuttering Treatment and Research (ISTAR). Prior to the recording of the controlled speech sample, the experimenter will briefly review and practice the fluency skills and prolongation with you for 10 minutes.

The entire process may take approximately one to two hours to complete, depending on your ease of uncontrolled and controlled speech production.

Segments from the two video-recorded samples of your speech will then be played to a group of 30 listeners. The listeners will rate the speech samples in terms of naturalness and likeability.

It is customary for research projects to ensure that the confidentiality of research participants is maintained by restricting access to research materials that would identify participants. To ensure privacy, the video-recorded speech samples will be identified by project identification number only. All tapes will be kept in a locked filing cabinet to which only project researchers will have access. The tapes

will be used only for research purposes.

Your participation in this study is completely voluntary. You may decide to withdraw from the study at any time without any negative consequences. If you consent to participate, please return one copy of this form with your signature.

If you have any questions about this study, either before or after you give your consent, please do not hesitate to call me at 476-0080. Thank-you for considering this request.

Connie Lam, Graduate Student
Department of Speech
Pathology and Audiology
University of Alberta
2-70 Corbett Hall

I have read the description of the research project entitled "Judges' evaluations of the post-treatment speech of stutterers and the speech of normal speakers" and I understand the terms of my participation. I consent to participate as a volunteer. I have received a copy of the consent form letter.

Name of Participant	Date
Project Researcher	Date

APPENDIX C

RESEARCH CONSENT FORM FOR GROUP B SPEAKERS
(Department of Speech Pathology and Audiology)

Consent form for study entitled: "Judges' evaluations of the post-treatment speech of stutterers and the speech of normal speakers".

You are being invited to participate in a research project about judges' perception of naturalness of stuttered and fluent speech and judges' preference or likeability for stuttered and fluent speech. It is being conducted by Connie Lam, a graduate student in the Department of Speech Pathology and Audiology at the University of Alberta. The project is supervised by Dr. Einer Boberg from the Department of Speech Pathology and Audiology. If you give your permission, an audiovisual recorded sample will be made of your speech while you converse with a volunteer stranger. This will be conducted at Corbett Hall or in a home.

Segments from the video-recorded speech sample will then be played to a group of 30 listeners. The listeners will rate the speech sample in terms of naturalness and likeability.

It is customary for research participants to ensure that the confidentiality of research participants is maintained by restricting access to research materials that would identify participants. To ensure privacy, the audiovisual speech samples will be identified by project identification number only. All tapes will be kept in a locked filing cabinet to which only project researchers will have access. The tapes will be used only for research purposes.

Your participation in this study is completely voluntary. You may decide to withdraw from the study at any time without negative consequences. If you consent to participate, please return one copy of this form with your signature.

If you have any questions about this study, either before or after you give consent, please do not hesitate to call me at 476-0080. Thank-you for considering this request.

Connie Lam, Graduate Student
Department of Speech
Pathology and Audiology
University of Alberta
2-70 Corbett Hall

I have read the description of the research project entitled "Judges' evaluations of the post-treatment speech of stutterers and the speech of normal speakers" and I understand the terms of my participation. I consent to participate as a volunteer. I have received a copy of the consent form letter.

_____ _____

Name of participant Date

_____ _____

Project Researcher Date

APPENDIX D

CHARACTERISTICS OF GROUP A SPEAKERS' UNCONTROLLED SPEECH

Speaker	Severity	%SS	Secondary behaviors
Speaker 1	moderate	16%	eye blinking, gaze aversion, restricted jaw movement, audible inspiration
Speaker 2	moderate	10%	breath holding, jaw deviation, head lowering, eye blinking
Speaker 3	mild	4%	head lowering, eye brow raising

Note. Mean %SS = 10%

APPENDIX E

RATING INSTRUCTIONS FOR SPEECH NATURALNESS
INFORMED CONSENT FORM FOR JUDGES
(Department of Speech Pathology and Audiology)

I am studying what makes speech sound natural or unnatural. You will be required to perform two tasks for this study. The entire procedure will require approximately 40 minutes in total to complete.

You will see and hear a number of audiovisual speech samples. The samples will be separated by a few seconds of silence. Your first task is to rate the **NATURALNESS** of each speech sample after you have seen and heard each sample. If the speech sample sounds highly natural to you, circle the number **1** on the scale. If the speech sample sounds highly unnatural to you, circle the number **9** on the scale. If the speech sample sounds somewhere between highly natural and highly unnatural to you, circle the appropriate number on the scale. Do not hesitate to use the ends of the scale (1 or 9) when appropriate. "Naturalness" will not be defined for you. Make your rating of how natural or unnatural the speech samples sound to you. Rate the speech naturalness of the sample in terms of the **speech quality** of the speaker. **Do not** make your judgements based on the content of the conversation or physical appearance of the speaker.

Please work independently. This task will require approximately 15 minutes to complete. After you have rated speech naturalness of all the speech samples, please answer the questions on the page following the rating scales. At the end of this task, you will have a 5 minute break prior to commencement of the second task of the study. Instructions for the second task will be provided after the break.

It is customary for research projects to ensure that privacy of research participants is maintained. Do not write your name or any other identifying information on the instruction sheet or rating forms. To ensure your privacy, all materials used in the study will be identified by project identification number only. All materials will be kept in a locked filing cabinet to which only project researchers will have access. Materials and data obtained from this study will be used only for research purposes.

Your participation in this study is completely voluntary. You may withdraw from the study at any time without negative consequences. If you have any questions about this study, please do not hesitate to ask. Thank-you.

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APPENDIX F

RATING INSTRUCTIONS FOR SPEECH PREFERENCE (LIKEABILITY) (Department of Speech Pathology and Audiology)

For the second task of this study, you will see and hear another set of audiovisual speech samples. The samples will be separated by a few seconds of silence. Your task is to rate your preference or **LIKEABILITY** for each speech sample after you have seen each sample. If the speech sample is one which you most like listening to, circle the number **1** on the scale. If the speech sample is one which you least like listening to, circle the number **9** on the scale. If your preference for listening to the speech sample is somewhere between "most like listening to" and "least like listening to", circle the appropriate number on the scale. Once again, rate your liking of the speech sample in terms of the **speech quality** of the speaker. **Do not** make your judgements based on the content of the conversation or physical appearance of the speaker. Please work independently. This task will require approximately 15 minutes to complete. After you have rated all the speech samples, please answer the questions on the page following the rating scales.

APPENDIX G

SPEECH NATURALNESS RATING FORM

Practice

P1. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

P2. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

P3. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

Sample

1. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

2. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

3. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

4. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

5. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

6. Highly Natural — Highly Unnatural

1-----2-----3-----4-----5-----6-----7-----8-----9

7. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

8. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

9. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

10. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

11. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

12. Highly Natural — Highly Unnatural
1-----2-----3-----4-----5-----6-----7-----8-----9

APPENDIX H

SPEECH LIKEABILITY (PREFERENCE) RATING FORM

Practice

P1. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

P2. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

P3. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

Sample

1. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

2. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7------8-----9

3. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

4. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

5. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

6. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

7. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

8. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

9. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

10. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

11. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

12. Most like listening to — Least like listening to

1-----2-----3-----4-----5-----6-----7-----8-----9

APPENDIX I

SPEECH NATURALNESS QUESTIONS

1) What characteristics of the speaker's speech led you to rate his speech as sounding "natural" ? (e.g. the speaker had normal sounding intonation, normal sounding rate).

2) What characteristics of the speaker's speech led you to rate his speech as sounding "unnatural" ? (e.g. the speaker's speech sounded too slow and unexpressive).

APPENDIX J

SPEECH LIKEABILITY QUESTIONS

1) What characteristics of the speaker's speech led you to rate his speech as "most like listening to" ?

2) What characteristics of the speaker's speech led you to rate his speech as "least like listening to" ?